

I claim:

1           **1.**     A method for selectively binding a neutral, positively-charged, or negatively-  
2 charged molecule, in solution or in the solid state, said method comprising contacting the  
3 molecule with a compound comprising a porphyrin macrocycle, and further comprising one  
4 or more carboranyl groups that are linked to the porphyrin macrocycle by carbon-carbon  
5 bonding.

1           **2.**     A method as recited in Claim 1, wherein the compound comprises a  
2 pentacoordinated or hexacoordinated metal ion at the core of the porphyrin macrocycle.

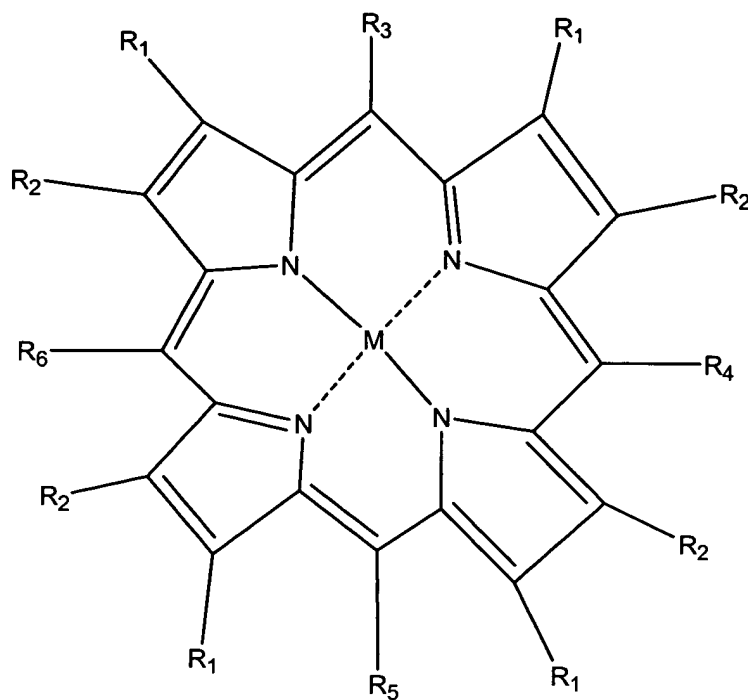
1           **3.**     A method as recited in Claim 1, wherein the compound comprises a zinc(II),  
2 iron(III), manganese(III), aluminum(III), or tin(IV) ion at the core of the porphyrin  
3 macrocycle.

1           **4.**     A method as recited in Claim 1, wherein the compound comprises one or  
2 more negatively-charged *nido*-carborane groups bound to the periphery of the porphyrin  
3 macrocycle.

1           **5.**     A method as recited in Claim 1, wherein the compound comprises one or  
2 more *closo*-carborane groups bound to the periphery of the porphyrin macrocycle.

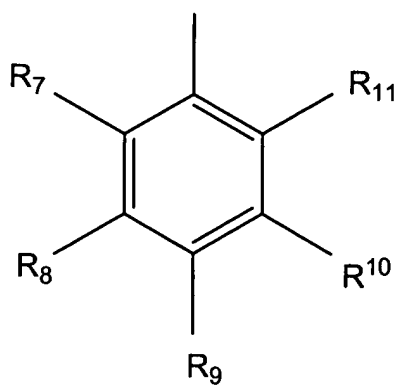
1           **6.**     A method as recited in Claim 1, wherein the core of the porphyrin macrocycle  
2 is positively charged or protonated.

7. A method as recited in Claim 1, wherein the compound has structure I:



I

wherein  $M$  is  $2H$  or a pentacoordinated or hexacoordinated metal ion;  $R_1$  and  $R_2$  are each independently hydrogen,  $C_1$  to  $C_4$  alkyl or hydroxyalkyl; and  $R_3$ ,  $R_4$ ,  $R_5$ , and  $R_6$  are each independently hydrogen, phenyl, or substituted phenyl having structure II:



II

29 wherein R7, R8, R9, R10, and R11 are independently hydrogen or a carboranyl group,  
30 wherein such a carboranyl group is linked to the phenyl group by a carbon-carbon bond;  
31 and wherein one or two of R7, R8, R9, R10, and R11 are hydrogen or such a carboranyl  
32 group; and  
33

34 wherein at least one of R3, R4, R5, and R6 is a substituted phenyl having structure II and  
35 having at least one such a carboranyl group.

1           **8.**     A method as recited in Claim 7, wherein at least two of R3, R4, R5, and R6  
2 are substituted phenyls having structure II and each having at least one such carboranyl  
3 group.

1           **9.**     A method as recited in Claim 7, wherein each of R3, R4, R5, and R6 is a  
2 substituted phenyl having structure II and each having at least one such carboranyl group.

1           **10.**    A method as recited in Claim 7, wherein at least two of R3, R4, R5, and R6  
2 are substituted phenyls having structure II and each having at least one such *nido*-  
3 carboranyl group.

1           **11.**    A method as recited in Claim 7, wherein each of R3, R4, R5, and R6 is a  
2 substituted phenyl having structure II and each having at least one such *c/oso*-carboranyl  
3 group.

1           **12.**    A method as recited in Claim 7, wherein at least two of R3, R4, R5, and R6  
2 are substituted phenyls having structure II and each having at least one such carboranyl  
3 group at R7 or R11.

1           **13.**    A method as recited in Claim 7, wherein each of R3, R4, R5, and R6 is a  
2 substituted phenyl having structure II and each having at least one such carboranyl group  
3 at R7 or R11.

1           **14.**    A method as recited in Claim 7, wherein at least two of R3, R4, R5, and R6  
2 are substituted phenyls having structure II and each having at least one such carboranyl  
3 group at R8 or R10.

1           **15.**    A method as recited in Claim 7, wherein each of R3, R4, R5, and R6 is a  
2 substituted phenyl having structure II and each having at least one such carboranyl group  
3 at R8 or R10.

1           **16.**    A method as recited in Claim 7, wherein at least two of R3, R4, R5, and R6  
2 are substituted phenyls having structure II and each having at least one such carboranyl  
3 group at R9.

1           **17.**    A method as recited in Claim 7, wherein each of R3, R4, R5, and R6 is a  
2 substituted phenyl having structure II and each having at least one such carboranyl group  
3 at R9.

1           **18.**    A method as recited in Claim 1, wherein the compound is selected from the  
2 group consisting of compounds **3, 4, 5, 6, 9, 10, 11, 12, 15, 16, 17, 18, 23, 24, 28, 29, 30,**  
3 **31, 33, 34, 35, and 36.**